South Carolina Department of Health and Environmental Control

ENVIRONMENTAL AFFAIRS

SHELLFISH MANAGEMENT AREA 15

2020 ANNUAL UPDATE

Shellfish Sanitation Section
Environmental Affairs
2600 Bull Street
Columbia, SC 29201

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SHELLFISH MANAGEMENT AREA 15
2020 ANNUAL UPDATE

[Data Through December 2019]

Prepared By:

Mike Marshall, State Shellfish Program Manager
Environmental Affairs – Office of Law Enforcement
927 Shine Avenue
Myrtle Beach, South Carolina 29577

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2020 ANNUAL UPDATE
Shellfish Management Area 15

Data Inclusive Dates:
01/01/17 thru 12/31/19

Classification Change:
X Yes ___ No

Shoreline Survey Completed: Yes

Prior Report & Date: 2019 Annual Update

(I)ncreased/(D)ecreased/(N)one:
I Approved
D Conditionally Approved
I Restricted
N Prohibited

SUMMARY

The review of Shellfish Management Area (SFMA) 15 water quality data for this 2020 Annual Update indicated an improvement in water quality in some areas as compared to the water quality data of last year's review. Twenty-two (22) of the twenty-seven (27) total monitoring stations met fecal coliform water quality criteria to be classified as Approved.

Rainfall and associated runoff continue to strongly influence water quality within portions of Area 15. For the past few years, there have been natural occurrences that have produced heavy rainfall. The above-average rainfall amounts are mostly due to a historic rain and flooding event that took place in October 2015, as well as Hurricane Matthew and Hurricane Irma which took its toll in October 2016, and September 2017, respectively.

Stations 15-03A and 15-03B were activated in Albergottie Creek in January 2014 to better assess the water quality in this portion of the management area. The data indicates that Albergottie Creek exhibits water quality that would deem the waterbody Restricted in classification.

There will be four classification changes implemented for the 2020-2021 shellfish harvesting season. Brickyard Creek has been classified as Approved from Station 15-03 to Station 15-02. McCalley Creek has been classified as Approved from Station 15-33 to Station 15-01A. Battery Creek has been classified as Approved from Station 15-10 to Station 15-28. Lastly, Wallace Creek will now be classified Restricted from Station 15-34 to the boundary of SFMA 15 for the upcoming shellfish harvesting season.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing, and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47, which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish is used by the United States Food and Drug Administration (USFDA) to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S. C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved Area - Growing areas shall be classified approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations that would render shellfish unsafe for human consumption. Approved classifications shall be determined upon a sanitary survey that includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, nor shall more than ten percent of the samples exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five-tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform MPN shall not exceed fourteen per one hundred milliliters, nor shall the estimated ninetieth percentile exceed an MPN of forty-three per one hundred milliliters (per five-tube decimal dilution). Computation of the estimated ninetieth percentile shall be determined using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Conditionally Approved Area - Growing areas may be classified conditionally approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in non-point source pollution from rainfall runoff or discharge of a major river, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as conditionally approved. Where appropriate, the management plan for each conditionally approved area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems), evaluation of each source of pollution, and means of rapidly closing and subsequently reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish shall not be directly marketed from a conditionally approved area until conditions for an approved classification have been met for a period of time likely to ensure the shellfish are safe for consumption. Shellstock from conditionally approved areas that have been subjected to temporary conditions of actual or potential pollution may be relayed to approved areas for purification or depurated through controlled purification operations only by special permit issued by the Department.

Restricted Area - Growing areas shall be classified restricted when sanitary survey data show a

moderate degree of pollution or the presence of deleterious or poisonous substances to a degree that may cause the water quality to fluctuate unpredictably or at such a frequency that a conditionally approved classification is not feasible. Shellfish may be harvested from areas classified as restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. The suitability of restricted areas for harvesting of shellstock for relay or depuration purposes may be determined through the use of comparison studies of background tissue samples with post-process tissue samples, as well as other process verification techniques deemed appropriate by the Department. For restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five-tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty (five-tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Conditionally Restricted Area - Growing areas may be classified conditionally restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as conditionally restricted. Where appropriate, the management plan for each conditionally restricted area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems and an evaluation of each source of pollution, and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as conditionally restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For conditionally restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of conditionally restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five-tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty per one hundred milliliters (five-tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

Prohibited Area - Growing areas shall be classified prohibited if there is no current sanitary survey report or if the sanitary survey report or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or otherwise indicate that such substances could potentially reach quantities that could render shellfish unfit or unsafe for human consumption.

BACKGROUND INFORMATION

Shellfish Management Area 15 (Area 15) consists of approximately 31,090 acres of shellfish growing area habitat located in Beaufort County. It includes the Beaufort River and Brickyard Creek and their tributaries, including McCalley, Albergottie, Broomfield, Battery, Chowan, Ballast, Station, and Morse Island Creeks. The area's northern boundary is the northern shore of McCalley Creek. The eastern boundary extends through Lady's Island to Highway 21, then to Morse Island Creek. The southern boundary is the Atlantic Ocean at the mouth of Port Royal Sound. The western boundary extends through Parris Island and follows the western shore of Battery Creek to the portion of McCalley Creek bordered by Highway 21.

The shellfish industry in South Carolina is based on the harvest of the eastern oyster (Crassostrea virginica) and hard clams (Mercenaria mercenaria). Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State shellfish grounds, Culture permits, and Kings Grant areas.

There are nine (9) Shellfish Culture Permit areas in SFMA 15 that are dedicated to the exclusive use of the lease holder and individuals they choose to allow to harvest. The majority of the shellfish resource and harvesting activity is located in Chowan, Distant Island and Wallace Creeks.

The public is allowed to harvest on five (5) State Shellfish Grounds (SSG) and one (1) Public Shellfish Ground (R) in Area 15, as long as the areas are in the Approved classification. S064 is located on Parris Island, S090 at Bermuda Bluff, S094 in Morse Island Creek, S117 in Distant Island Creek and S118 in Wallace Creek. Recreational harvesting is allowed for clams and oysters on both State Shellfish Grounds and Public Shellfish Grounds, and commercial harvesting by properly licensed and permitted individuals is currently allowed on State Shellfish Grounds only, subject to seasons established by SCDNR. Harvest ground R121 in Wallace (Capers) Creek is restricted to recreational harvesting only.

The shellfish-harvesting season in South Carolina typically extends from October 1 through May 31, although actual dates may vary. SCDNR has the authority to alter the shellfish-harvesting season for management purposes. The South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that all shellfish harvested in South Carolina waters are safe for human consumption.

The harvesting classifications of Area 15 **prior** to this sanitary survey were as follows:

PROHIBITED

1. Brickyard Creek, 1,000 feet radius around the MCAS refueling depot as measured from the center of the dock.
2. Albergottie Creek, from its headwaters to the mouth of Brickyard Creek.
3. Broomfield Creek, from its confluence with Beaufort River northward to the Brickyard Road North bridge.
4. Factory Creek, entire waterbody.
5. Cat Island Creek, entire waterbody.
6. Battery Creek and its tributaries, from Station 15-24 at the Highway 280 (Parris

Island Gateway) Bridge to its confluence with the Beaufort River.

7. Battery Creek from its headwaters to curve near Mink Point Community Dock at Station 15-19.
8. Archers Creek, from the boundary with Area 17 to its confluence with Beaufort River.
9. Ballast Creek, from the boundary with Area 17 to its confluence with Beaufort River.
10. McCalley Creek, from Station 15-33 to the headwaters.
11. Beaufort River from the mouth of Albergottie Creek to the mouth of Ballast Creek near Station 15-15.
12. Village at Battery Creek Dock (former Battery Creek Marina) closure zone (410 ft. radius).

RESTRICTED

1. McCalley Creek, from Station 15-33 to Station 15-01A.
2. Battery Creek, including all tributaries, from Station 15-10 continuing upstream via the left split to Station 15-19.
3. Brickyard Creek from Station 15-03 extending north to Station 15-02.

CONDITIONALLY APPROVED

1. Wallace Creek, entire waterbody.

APPROVED

1. McCalley Creek from sample station 15-01A to its confluence with Brickyard Creek.
2. Brickyard Creek from the northern boundary of Area 15 continuing south to Station 15-02.
3. Battery Creek from sample station 15-24 continuing upstream towards Station 15-10 then into the right (South) split terminating near Station 15-28.
4. Chowan Creek, entire waterbody.
5. Distant Island Creek, entire waterbody.
6. Beaufort River, from sample station 15-15, continuing South to the southern boundary of Area 15.
7. Station Creek, from its confluence with the Port Royal Sound to the boundary of Area 15.
8. Morse Island Creek, from its confluence with the Port Royal sound to the boundary of Area 15.

Station Addition/Re/Deactivation/Modification: None

POLLUTION SOURCE SURVEY

SURVEY PROCEDURES

The South Carolina Department of Health and Environmental Control, Environmental Affairs, Lowcountry – Beaufort Shellfish Sanitation Staff, routinely conducts shoreline survey activities in Area 15. Extensive visual examination of lands adjacent to the waters of Area 15 was

conducted to determine type of activities, location of significant concentrations of domestic animals and other actual and potential sources of pollution entering shellfish growing waters.

POINT SOURCE POLLUTION

A. Municipal and Community Waste Treatment Facilities–The Beaufort Jasper Water and Sewer Authority (BJWSA) is the designated utility that is responsible for public sewer services within the boundaries of Area 15. The BJWSA/Port Royal Water Reclamation Plant (PRWRP) supplies sewer services to Parris Island, Port Royal, City of Beaufort as well as the surrounding unincorporated areas. This facility is physically located within the Area 17 boundaries, but discharges effluent in Area 15. This plant is a 7.5 mg/d facility consisting of a mechanical bar screen, grit classifier, low and high end anoxic aerated zone activated sludge systems, equalization tank, two secondary clarifiers, two aerobic digesters with a Andritz filter press system, three sets of a twelve-disc Aqua Aerobic membrane filter system, and a Trojan 3000 Plus 3 bank UV disinfection system. This plant consolidated discharges from the USMC Beaufort Air Station discharge to Albergottie Creek, SC0048967 and the BJWSA Parris Island discharge to Beaufort River.

There were few sanitary sewer overflows (SSO) documented during this annual review period. One SSO occurred in Ballast Creek which spilled 5,000 gallons due to tree roots that damaged a force main in September 2017. Additionally, because of heavy rains and storm surge associated with Hurricane Matthew in October of 2016, multiple sewer overflows were documented and required closures in Area 15. The affected areas remained closed for a minimum of 21 days and are summarized in Table 6.

The PRWRP discharge was evaluated to determine impacts to the environment and public health. A Beaufort River Total Maximum Daily Load (TMDL) model was developed using data from seven established United States Geological Survey (USGS) gauging stations. Continuous data for water level, temperature, specific conductance, and dissolved oxygen, from December 1998 through September 2001, provided the basis for establishing system hydrodynamics and water quality. EPA approved the TMDL in April 2006. Critical conditions for the Beaufort River were derived using this water quality model.

A near-field mixing zone analysis was performed to establish dilution ratios to protect aquatic biology from toxicity issues and to predict in-stream concentrations of fecal coliform during critical plant operating conditions. Modeling parameters included critical tide conditions, 10.0 mg/d flow, and daily maximum permitted fecal coliform concentrations. Modeling also included extreme event conditions (disinfection process failure). A 5,000 cfu/100 ml discharge (based upon actual pre-disinfection process sampling) predicts in-stream standards of 14 cfu/100ml can be achieved approximately 4,100 feet from the outfall indicating that the current approximately 20,000 feet (south) and 41,000 feet (north) Prohibited closure is protective of public health and will not require expansion based upon an increase in discharge to 10.0 mg/d. Additionally, increase of the existing 4.8 mg/d discharge permit includes a two (2) hour notification requirement upon discovery of, or in anticipation of, a fecal coliform violation.

BJWSA also has one of the two Land Application Permits in Area 15. This permit, ND0085341, authorizes spray irrigation of treated effluent on the 58.1 acre Secession Golf Course located on Cat Island. Cat Island is located at the confluence of Beaufort River and

Chowan Creek within Area 15. The second permitted spray irrigation site in Shellfish Management Area 15 is T.J. Barnwell Utility, Inc, ND0067393, which operates a spray site at the Pleasant Point Golf course on Ladies Island.

B. Industrial Waste - Several industrial discharge permits are issued within Area 15. Barnwell Resources operates a construction and demolition (C&D) landfill and is permitted under SCR004063 to discharge stormwater into Broomfield Creek. The Fred Trask Mine (SCG730283) has a dewatering permit for their sand mining operation. The Mitchell Brothers/Hopwood Mine also has a permit for dewatering a sand mining operation. The USMC, in conjunction with permit number SC0002577, discharges non-contact cooling water from the on-site Power Plant to the Beaufort River. Springs Industries/Wanchem - SC0046701 conducts groundwater remediation activities and discharges to McCalley Creek. Additionally, the BJWSA Port Royal Water Reclamation Facility has an approved pretreatment program and accepts some industrial wastes from businesses located in the Beaufort Industrial Park.

C. Marinas – In 2007, prompted by the Department's Office of Coastal Resource Management (OCRM) marina definition change, the Shellfish Sanitation Section incorporated the following definition. S.C. Regulation 61-47 Shellfish defines Marina as any of the following: (1) locked harbor facility; (2) any facility which provides fueling, pump-out, maintenance or repair services (regardless of length); (3) any facility which has effective docking space of greater than 250 linear feet or provides moorage for more than 10 boats; (4) any water area with a structure which is used for docking or otherwise mooring vessels and constructed to provide temporary or permanent docking space for more than ten boats, such as a mooring field; or (5) a dry stack facility.

Currently, there are eight (including MCAS) permitted marina locations in Area 15. Port Royal Landing and Downtown Beaufort Marina have marine sewage pump-out facilities. A pump-out vessel is permitted to operate and is in frequent use at Downtown Beaufort Marina of Beaufort. Marsh Harbor Boatyard is a dry stack marina and does not have a pump-out facility. Port Royal Seafood is a commercial shrimp dock with no pump out. Battery Creek Marina, now the Village at Battery Creek Marina, has been re-developed. Ladies Island Marina does not have a pump out facility. The S.C. Ports Authority Port Royal Terminal on Battery Creek has ceased operations for cargo shipping and is non-operational. All facilities are encompassed by administratively prohibited closures.

D. Radionuclides - Sources of radionuclides have not been identified within Area 15, and radionuclide monitoring has not been conducted. No other sources of poisonous or deleterious substances have been identified within the area.

NONPOINT SOURCE POLLUTION

A. Urban and Suburban Stormwater Runoff - Stormwater runoff may impact water quality by transporting fecal coliform bacteria (and other pollutants) from land to the shellfish growing area. Stormwater from roads, residences, and agricultural land is directed to the lowest point of elevation - typically the nearest creek or marsh. In addition, there are freshwater wetland areas, ditches, and impoundments that drain into tidal creeks.

Beaufort County enacted a Stormwater Management Utility which was established by county

ordinance in 2001 and amended and enacted most recently in 2015. The Stormwater Utility is guided by a Comprehensive Master Plan and a Stormwater Management Utility Board which is dedicated to stormwater-related activities. The Comprehensive Master Plan identified nine (9) program elements that the utility must address. These elements are: Stormwater Control Regulations, Water Quality Controls for Existing Developments, Water Quality Monitoring, Annual Maintenance, Inventory of Secondary Stormwater Management Systems, Additional and On-going studies and analysis, Public Information, and Utility Administration.

The Comprehensive Master Plan is funded through the fees collected by Beaufort County. The Master Plan was designed to identify problem areas related to stormwater, and to recommend a plan to solve problems and better control the impacts on receiving waters in Beaufort County. The Stormwater Management Utility also partners with four Municipalities which include: The Town of Hilton Head Island IGA, Town of Bluffton IGA, Town of Port Royal IGA, and the City of Beaufort IGA. The above information was gathered from the Beaufort County Stormwater webpage which can be found at:

https://www.beaufortcountysc.gov/stormwater/index.html

The Beaufort County Manual for Stormwater Best Management Practices and Design Practices (BMP's) was developed in May 2010 and most recently revised in 2018. This manual has recommended policies and standards for stormwater pollution control for new developments, policies and standards for existing developments, and structural BMP design guidelines. This manual also has the Average Annual Fecal Coliform Runoff Load Calculations for various land uses with percent reductions required to meet fecal coliform loading targets. This manual not only requires pollutant removal, but also considers stormwater volume control to meet the County's antidegradation goals. Sec. 99-107 of the County Codes sets requirements for on-site stormwater systems: enforcement, methods, and inspections.

On June 4, 2014, SCDHEC designated Beaufort County as a Municipal Separate Storm Sewer System (MS4). MS4 is a component of the National Pollutant Discharge Elimination System (NPDES). The notice of intent was submitted and the expected effective date was October 1, 2015 (Beaufort County Stormwater Utility, 2015).

Most land disturbing activities in South Carolina must comply with the Stormwater Management and Sediment Reduction Act of 1991. The final regulations, effective on June 28, 2002, establish the procedures and minimum standards for a statewide stormwater management program. For activities in the eight coastal counties, additional water quality requirements are imposed. For all projects, regardless of size, which are located within one-half mile of a receiving water body in the coastal zone, the criteria for permanent water quality ponds having a permanent pool is that they are designed to store the first inch of runoff from the entire site over a 24-hour period or storage of the first one inch of runoff from the built-upon portion of the property, whichever is greater. Storage may be accomplished through retention, detention, or infiltration systems, as appropriate for the specific site. In addition, for those projects that are located within 1000 feet of shellfish beds, the first one and one-half inches of runoff from the built-upon portion of the property must be retained on site. Since 1992, these regulations have been applied to the development of residential subdivisions, golf courses, and business areas.

B. Agricultural Runoff - There isn't great potential for agricultural nonpoint source pollution in Area 15, however, a number of properties with small herds of cattle and horses are sparsely located throughout. No SCDHEC permitted agriculture facilities exist in this shellfish management area.

C. Individual Sewage Treatment and Disposal (ISTD) Systems - Typically, older homes and businesses in Area 15 utilize ISTDs while the majority of new construction is serviced by central sewer collection and distribution systems. Homes in more rural areas, such as those on St. Helena Island adjacent to Wallace/Capers Creek, utilize ISTDS.

D. Wildlife and Domestic Animals - This area supports populations of white-tailed deer, raccoons, wading birds, migratory waterfowl, and other wildlife, which may contribute to fecal coliform levels in some areas. Domestic animals present in the area, including dogs, cats, horses, and goats, as well, ducks and geese inhabiting numerous natural wetland ponds and impoundments throughout the management area, likely contribute to some fecal coliform loading within the shellfish growing area.

E. Boat Traffic - The Atlantic Intracoastal Waterway (AIWW) begins at northern boundary of Area 15 at the confluence of Brickyard Creek and Coosaw River. The waterway extends through Beaufort River and Port Royal Sound and eventually reaches the area's southern boundary at Skull Creek at Hilton Head Island. Numerous commercial and recreational vessels utilize this North to South route. Furthermore, there are seven public boat landings in Area 15 which are frequently used.

F. Hydrologic and Habitat Modification - Hydrologic and habitat modification in estuarine areas requires both State and federal approval. Portions of the AIWW require maintenance dredging. The U.S. Army Corps of Engineers utilizes designated tracts of land adjacent to the AIWW as dredge spoil sites.

NATURALLY OCCURRING PATHOGENS

A. Marine Biotoxins - Bivalve shellfish contamination from marine biotoxins has not been shown to be a human health concern within Area 15. During the winter and spring of 1988, South Carolina experienced an occurrence of "Red Tide", specifically *Ptychodiscus brevis* (*K. brevis*), which affected water quality in other coastal areas of the state. There have been no documented reoccurrences of this organism at levels requiring emergency response in South Carolina waters subsequent to the 1988 event. Due to the vast media coverage of events related to *Pfiesteria pisicida*, the Department participates in a State Task Group on Toxic Algae and operates a toxic algae emergency response team.

B. *Vibrio parahaemolyticus* – Because State water temperatures exceed 81 degrees Fahrenheit (F) during June through September, *Vibrio parahaemolyticus* (Vp) management controls must be implemented during these months. Management controls for permitted Aquaculture facilities are specifically addressed in R.61-47. The season for wild-stock harvest is currently closed from May 16 through September 30. The Department is currently opposed to issuance of special wild-stock harvest permits to Certified Shippers during the closed season. Special permit conditions for maricultured triploid oysters during the vibrio control months must include current R.61-47 and NSSP temperature control requirements to be included in

the Certified Shipper's HACCP plan.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

PHYSIOGRAPHY

Area 15 is part of the Broad River estuary, which is a drowned river valley system and the largest of Sea Island Coastal Region estuaries (approx. 219 square kilometers). This estuary, which includes Broad River, Beaufort River, Port Royal Sound, and several tidal tributaries, includes an extensive system of marshes, tidal creeks, and sea-islands. The average depth of the estuary is approximately 7 meters at mid tide level. Broad, deep natural channels exist throughout Port Royal Sound, Beaufort River, and major tidal tributaries. Large shoal areas occur primarily in the Beaufort River and the Port Royal Sound. The AIWW (an average of 12 feet at MLW) is the only maintained navigational channel in the area. (NOAA, 1994) Tides in Area 15 are semidiurnal, consisting of two (2) low and two (2) high tide occurrences each lunar day. Mean tidal range within Port Royal Sound ranges from 6.15 feet to 8.15 feet. Spring tidal range is between 7.13 feet and 9.45 feet (www.co-ops.nos.noaa.gov). The greatest tidal ranges of the year typically occur around full moon during the months of September through December. There is considerable variation in the normal tide range due to the prevailing strength and direction of wind.

In 2017, the collection of rainfall data has been improved for a more consistent, accurate, and reliable data set that can be accessed directly from a shellfish staff member's computer or phone. With assistance from the National Weather Service's, Southeastern River Forecast Center, the development of the South Carolina Shellfish Rainfall Program was introduced and utilized. This new technology provides shellfish program staff with real-time daily updates for rainfall accumulation in each of the South Carolina shellfish growing management areas, as well as providing critical triggers that alert staff to when rainfall thresholds for closures are exceeded.

The annual total of rainfall in 2019 was 48.56 inches. This total was well above the 10-year average of 42.19 inches. Normally, approximately 40% of the annual rainfall falls in the three-month period from June to August. Weather patterns during this time period are often characterized by thunderstorms and thundershower activity of short duration. In addition, these three months also have the highest numbers of days with rainfall greater than 1.00". The months of December through March historically have the greatest number of days with rainfall exceeding 0.10" and 0.50". Rainfall events during these months are typically of a longer duration

Prevailing wind direction during January through February is generally from the west to northwest with an average speed of 8-12 MPH. During the months of March through August, wind direction is typically a southerly component at an average speed of 7-10 MPH and September through December normally maintains a north-north easterly wind direction with an average speed of 6-8 (NOAA).

The salinity structure is primarily determined by the seasonal freshwater discharge from the Coosawhatchie River and mean salinities vary less than 5ppt between typical high and low salinity periods. The northern portion of Area 15 receives some freshwater inflow into Brickyard Creek from the Coosaw River.

WATER QUALITY STUDIES

DESCRIPTION OF PROGRAM

The Department utilizes a systematic random sampling (SRS) strategy within Area 15 in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each calendar year thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays, and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July 1998, an updated data analysis procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station, yet provides a six-sample "cushion" (above the NSSP required 30 minimum) for broken samples, lab error, breakdowns, etc. This also allows each annual report to meet the NSSP Triennial Review sampling criteria.

During the period 01/01/17 through 12/31/19, eight hundred seventy-four (874) surface water samples (<1.0 ft. deep) were collected at the twenty-seven (27) currently active Area 15 monitoring stations for bacteriological analyses. Samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to the South Carolina Department of Health and Environmental Control Environmental Affairs Lowcountry – Beaufort laboratory in Burton, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. Upon receipt at the laboratory, sample sets that exceeded a 30-hour holding time or contained a temperature control >10 degrees C. were discarded. Samples collected after September 1, 1986 have been analyzed using the five-tube/three dilution modified A-1 method described by Nuefeld (1985).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using automatic temperature compensated refractometers. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined using the National Oceanic and Atmospheric Administration, 2017 Tides and Currents Predictions website located at http://tidesandcurrents.noaa.gov/curr_pred.html.

Special Sampling Studies:

Battery Creek:

During March - April 2007 Lockheed Martin Technology Services, under contract from and with the assistance of the USEPA, conducted a study of a portion of Battery Creek to determine if a former industrial operation had created a threat to public health through contamination of the creek with metals (arsenic and lead). Results of the study, documented in the July 23, 2007 correspondence from Lockheed Martin Technology Services to EPA [SUBJECT: Sediment XRF Screening and Sediment/Oyster Tissue Analysis (0258-DTR-072307)] indicated no oyster tissue samples exceeded the USFDA action levels of 86 mg/kg wet weight for As and 1.7 mg/kg wet

weight for Pb. X-ray Fluorescence sediment screening did not show a gradient for As or Pb that would indicate the need for determining a biota/sediment accumulation factor. The study concluded that oyster tissue results were all below USFDA Guidance Levels and did not indicate any risk for human exposure through consumption.

Beaufort River:

A joint USFDA and SCDHEC dye study was conducted in April 2011 in conjunction with BJWSA WWTP consolidation project. This study was finalized in CY2012 by USFDA officials

In response to the deactivation and subsequent closing of the MCAS Waste Water Treatment Plant, this study was designed to better determine safety closure zones along the Beaufort River at the WWTP discharge area. Wastewater from the MCAS is now being sent to the consolidated plant in Port Royal with a permitted discharge outfall located adjacent to the north side of the Port Royal Marina. The final conclusion of this study indicated a possible reduction to the existing safety closure zone and "Prohibited" classification along the Beaufort River. The title of this final study report is "*Port Royal WRF Effluent Dilution Study", Beaufort River, SC, September 25-27, 2011.* Publication date unknown. A copy of this study may be obtained through an FOIA request located on the SCDHEC webpage.

MONITORING RESULTS

During this annual reporting period, stations 15-01, 15-01A, 15-02, 15-03, 15-04, 15-05, 15-06, 15-10, 15-15, 15-16, 15-17, 15-18, 15-19, 15-21, 15-23, 15-24, 15-25, 15-26, 15-27, 15-28, and 15-33, and 15-34 have met a fecal coliform MPN geometric mean of 14 or a fecal coliform MPN estimated 90th percentile value of 43, thus meeting the statistical criteria for Approved classification.

Stations 15-03A, 15-03B, 15-20, 15-29, and 15-30 exceeded a fecal coliform MPN geometric mean of 14 or a fecal coliform MPN or an estimated 90th percentile value of 43, thus failing the statistical criteria for the Approved classification and will, in turn, be classified as Restricted. A fecal coliform bacteriological data summary is included in this update as Table # 2.

In October 2017, Station 15-34 was added in Wallace Creek. This station was strategically placed about halfway between stations 15-18 and 15-20 to better analyze the water quality in this portion of the growing area.

CONCLUSIONS AND RECOMMENDATIONS

The review of Shellfish Management Area 15 water quality data for 2017-2019 indicated that water quality improved overall. Twenty-two (22) of twenty-seven (27) total monitoring stations meet the fecal coliform water quality criteria for an Approved classification.

There will be four changes in classification for SFMA 15 for the 2020-2021 shellfish harvesting season.

Station 15-03 met the fecal coliform bacteria standard for an approved classification and will be upgraded for this upcoming season. This will impact the portion of Brickyard Creek extending

north from Station 15-03 to Station 15-02 along with all tributaries located within this potion of Brickyard Creek. McCalley Creek has been classified as Approved from Station 15-33 to Station 15-01A. Battery Creek has been classified as Approved from Station 15-10 to Station 15-28.

Lastly, Wallace Creek will now be classified Restricted from Station 15-34 to the boundary of SFMA 15 for the upcoming shellfish harvesting season instead of Conditionally Approved. This portion of Wallace Creek was previously under a Conditional Management Plan using rainfall as an indicator for its open or closed status. When rainfall was greater than or equal to 0.70 inches (in a 24-hour period) as measured by Prism Climate Group, Oregon State University this area would close until bacteriological special sampling was conducted. During this review period Station 15-20 failed to meet the statistical criteria for an Approved or Conditionally Approved classification and therefore not recommended to be managed conditionally at this time.

Based on review of fecal coliform bacteriological data and the pollution source survey, Area 15 is potentially impacted by four sources of actual or potential pollution.

Point Source Pollution

Numerous point sources such as wastewater treatment facilities and marinas are located within Area 15. Administratively Prohibited closures are established around these pollution sources.

Non-Point Source Runoff

Storm water runoff appears to be a major source of fecal coliform bacteria contamination in Area 15. The impact of rainfall and stormwater runoff on fecal coliform bacteria concentrations may be particularly evident during an El Niño event when the management area could receive abnormally high rainfall amounts. The resulting elevated fecal coliform bacteria concentration could have an adverse impact on shellfish harvesting classification for many stations. Lower salinities normally occur in the period between January and April. Elevated bacteria concentrations also occur following rainfall events (>1.00 inches) and in samples collected at low tide.

The largest possible sources of fecal coliform bacteria contamination include failing septic systems, pets, agricultural animals (horses and cows), wildlife, and drainage from roads and freshwater wetlands into receiving shellfish harvesting waters.

Freshwater Inflow

There are no freshwater inflow resources affecting Area 15, although wildlife, shallow ground water flow and soil bacteria may cause elevated fecal coliform concentrations throughout the management area. Although these occurrences are major non-point impacts, it appears these impacts have a minimal influence within this management area as indicated by statistical water quality data.

Individual Sewage Treatment and Disposal Systems (ISTDS)

ISTDS or a municipal central sewer service homes are adjacent to the shellfish harvesting waters in Area 15. Homes in older developed areas utilize ISTDS while most new developments are

tied into municipal central sewer. Soils in most areas are considered suitable for ISTDS and systems should operate properly if maintained. Older, systems represent a potential source of fecal coliform contamination in the Battery Creek and Wallace Creek areas, particularly during periods of heavy rainfall.

Sewage overflows are infrequent and will continue to be managed in accordance with National Shellfish Sanitation Program emergency closure guidelines.

All existing marinas should retain their administrative Prohibited Classification. Additionally, during the harvest season, all Approved portions of the estuary should continue to be placed under a precautionary closure upon issuance of an official National Weather Service Hurricane Warning or upon receipt of four or more inches of rainfall within twenty-four hours, as recorded by the National Weather Service, Southeastern River Forecast Center.

Based upon the findings of this Annual Update, the following classification is recommended:

PROHIBITED

1. Brickyard Creek, 1,000 feet radius around the MCAS refueling depot as measured from the center of the dock.
2. Albergottie Creek, from its headwaters to the mouth of Brickyard Creek.
3. Broomfield Creek, from its confluence with Beaufort River northward to the Brickyard Road North bridge.
4. Factory Creek, entire waterbody.
5. Cat Island Creek, entire waterbody.
6. Battery Creek and its tributaries, from Station 15-24 at the Highway 280 (Parris Island Gateway) Bridge to its confluence with the Beaufort River.
7. Battery Creek from its headwaters to curve near Mink Point Community Dock at Station 15-19.
8. Archers Creek, from the boundary with Area 17 to its confluence with Beaufort River.
9. Ballast Creek, from the boundary with Area 17 to its confluence with Beaufort River.
10. McCalley Creek, from Station 15-33 to the headwaters.
11. Beaufort River from the mouth of Albergottie Creek to the mouth of Ballast Creek near Station 15-15.
12. Village at Battery Creek Dock (former Battery Creek Marina) closure zone (410 ft. radius).

RESTRICTED

1. Wallace Creek, from Station 15-34 to the boundary of SFMA 15.
2. Battery Creek, including all tributaries, from Station 15-28 continuing upstream to Station 15-19.

CONDITIONALLY APPROVED

None

APPROVED

1. McCalley Creek from sample station 15-33 to its confluence with Brickyard Creek.
2. Brickyard Creek from the northern boundary of Area 15 continuing south to Station 15-03.
3. Battery Creek from sample Station 15-24 continuing upstream to Station 15-28.
4. Wallace (Capers) Creek from Station 15-18 to Station 15-34.
5. Chowan Creek, entire waterbody.
6. Distant Island Creek, entire waterbody.
7. Beaufort River, from sample station 15-15, continuing South to the southern boundary of SFMA 15.
8. Station Creek, from its confluence with the Port Royal Sound to the boundary of SFMA 15.
9. Morse Island Creek, from its confluence with the Port Royal sound to the boundary of SFMA 15.

Station Addition/Re/Deactivation/Modification: None

Analysis of sampling data for Area 15 demonstrates the probability of a significant impact from rainfall exceeding 4.00" in a 24-hour period. Therefore, a precautionary closure of Area 15 will be implemented following rainfall events of greater than 4.00" in a 24-hour period, as measured by the National Weather Service, Southeaster River Forecast Center. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States have been published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (National Weather Service). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (National Research Council, 1985).

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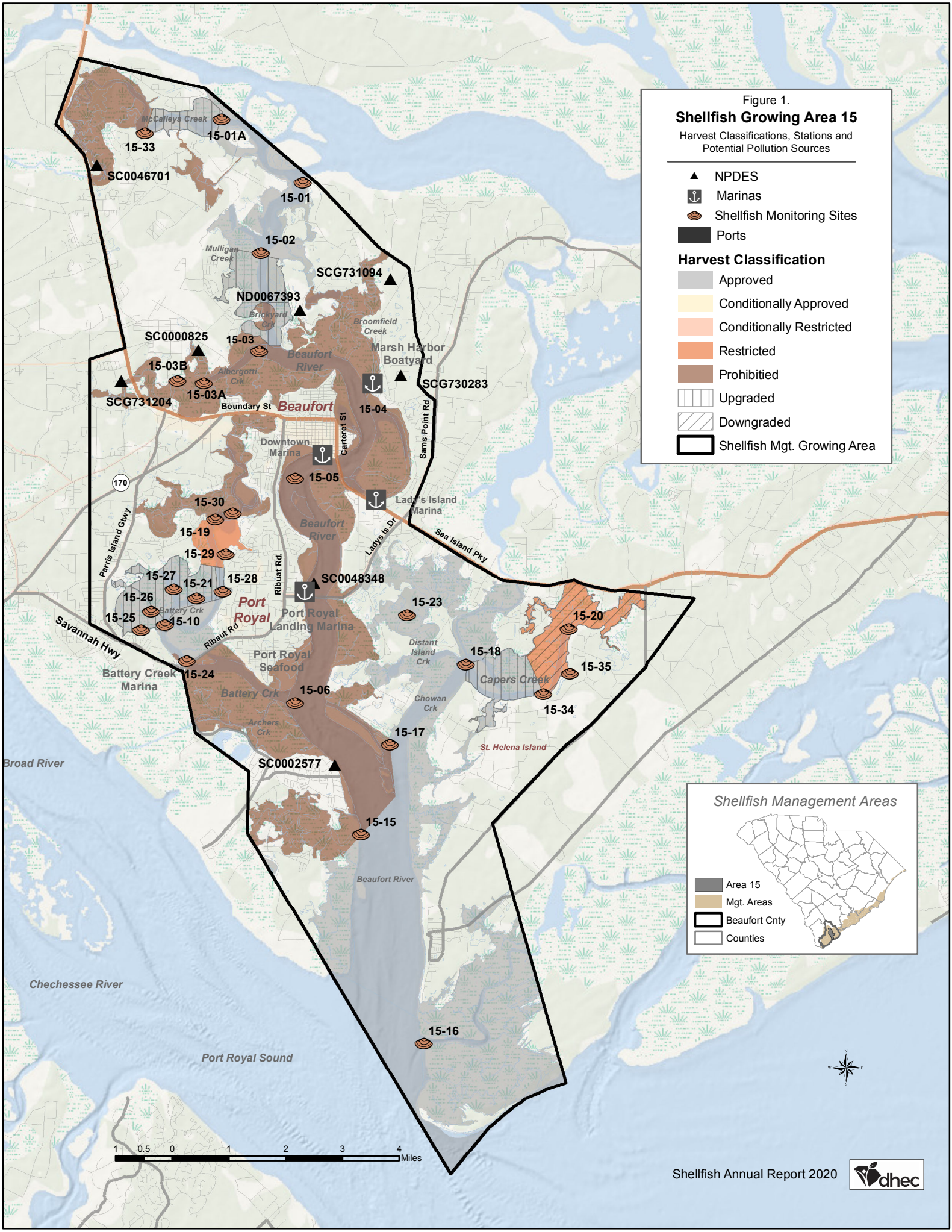
Figure 1.
Shellfish Growing Area 15
Harvest Classifications, Stations and Potential Pollution Sources
NPDES
Marinas
Shellfish Monitoring Sites
Ports
Harvest Classification
Approved
Conditionally Approved
Conditionally Restricted
Restricted
Prohibitied
Upgraded
Downgraded
Shellfish Mgt. Growing Area
15-33
15-01A
SC0046701
15-01
15-02
SCG731094
ND0067393
SC0000825
15-03
15-03B
15-03A
SCG731204
SCG730283
15-04
15-05
15-30
15-19
15-29
15-27
15-21
15-28
15-26
15-25
15-10
SC0048348
15-23
15-20
15-18
15-35
15-34
15-24
15-06
15-17
SC0002577
15-15
15-16
McCalleys Creek
Mulligan Creek
Brickyard Crk
Broomfield Creek
Beaufort River
Albergotti Crk
Boundary St
Beaufort
Downtown Marina
Carteret St
Sams Point Rd
Marsh Harbor Boatyard
Lady's Island Marina
Ladys Is Dr
Sea Island Pky
Parris Island Gtwy
Ribaut Rd.
Port Royal
Port Royal Landing Marina
Battery Crk
Ribaut Rd
Savannah Hwy
Port Royal Seafood
Battery Creek Marina
Archers Crk
Distant Island Crk
Capers Creek
Chowan Crk
St. Helena Island
Broad River
Chechessee River
Port Royal Sound
Shellfish Management Areas
Area 15
Mgt. Areas
Beaufort Cnty
Counties
1 0.5 0 1 2 3 4 Miles
Shellfish Annual Report 2020
dhec

TABLE # 1
Shellfish Management Area 15
WATER QUALITY SAMPLING STATIONS DESCRIPTION

Station	Description
15-01	Brickyard Creek at Range Marker
15-01A	McCalley Creek at Paukie Island
15-03	Mouth of Albergottie and Brickyard Creek
15-03A	Albergottie Creek 1.0 miles upstream of Station 15-03
15-03B	Albergottie Creek 700 feet SE of MCAS Hunting Club Fishing Pier
15-04	Factory Creek – near marker "G223"
15-05	Beaufort River – Downtown Marina 500' NW of marker "G239"
15-06	Mouth of Battery Creek and Beaufort River near marker "R42"
15-02	Mulligan Creek at Brickyard Creek
15-10	Battery Creek at Five Points Creek
15-15	Ballast Creek at Beaufort River
15-16	Station Creek at Beaufort River
15-17	Cat Island Creek at Chowan Creek
15-18	Second Middle Marsh in Chowan Creek
15-19	Battery Creek 1000 feet below Rabbit Island
15-20	Capers Creek SSG at Penn Community Services Retreat Center
15-21	Unnamed creek at (former) discharge of BC High and Cherry Hill High
15-23	Distant Island State Shellfish Ground
15-24	Battery Creek - SC Highway 280 Bridge
15-25	Battery Creek - Dowlingwood tributary
15-26	Battery Creek - Picket Fence tributary
15-27	Battery Creek - Cherry Hill tributary
15-28	Battery Creek - Storm water outfall under RR track
15-29	Battery Creek - Tributary on right side before Battery Shores
15-30	Battery Creek - Cottage Farms Community Dock
15-33	McCalley Creek, 0.5 miles upstream of station 15-01A
15-34	Wallace Creek, ~1.5 miles upstream from Station 15-18

(Total 27 Active)

TABLE #2

Shellfish Management Area 15

Fecal Coliform Bacteriological Data Summary
From Shellfish Water Quality Sampling Stations Between

January 01, 2017 and December 31, 2019

Station #	01	01A	02	03	03A	03B	04	05	06	10	15
Samples	31	31	32	32	32	32	33	33	33	33	33
Geometric Mean	4	6	7	11	18	25	7	3	3	5	3
90th percentile	12	18	23	36	72	101	23	9	7	13	10
Water Quality	A	A	A	A	R	R	A	A	A	A	A
Classification	A	A	A	P	P	P	P	P	P	A	P

Station #	16	17	18	19	20	21	23	24	25	26	27
Samples	33	33	32	33	33	33	33	33	33	33	33
Geometric Mean	3	4	4	10	13	5	6	6	11	7	7
90th percentile	7	13	10	38	58	17	21	18	39	24	25
Water Quality	A	A	A	A	R	A	A	A	A	A	A
Classification	A	P	A	P	R	A	A	P	A	A	A

Station #	28	29	30	33	34
Samples	33	33	33	32	32
Geometric Mean	6	13	13	8	8
90th percentile	21	76	53	24	37
Water Quality	A	R	R	A	A
Classification	R	R	P	P	R

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

TABLE #3

Fecal Coliform Historical Trend Sheet

Area 15 Stations 90thO%ile Values for Annual Updates Related to Rainfall

Station #	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
15-01	12	25	30	30	19	18	12	10	10	11	10
15-01A	18	32	28	26	14	13	9	6	9	12	15
15-02	23	36	35	32	21	21	20	20	21	23	17
15-03	36	45	43	49	34	33	21	20	20	ND	ND
15-03A	72	110	96	110	87	164	ND	ND	ND	ND	ND
15-03B	101	174	173	188	124	231	ND	ND	ND	ND	ND
15-04	23	32	29	32	26	28	21	16	17	ND	ND
15-05	9	11	10	9	8	7	7	8	10	ND	ND
15-06	7	11	11	12	9	7	8	8	12	ND	ND
15-10	13	30	33	36	19	17	13	13	14	18	22
15-15	10	14	15	15	12	11	8	14	12	14	12
15-16	7	9	9	5	4	4	5	6	7	6	6
15-17	13	21	15	16	11	18	14	14	9	8	8
15-18	10	15	21	20	15	16	14	18	13	11	8
15-19	38	79	108	106	62	41	47	54	55	48	40
15-20	58	84	101	50	26	23	32	63	70	73	44
15-21	17	24	26	35	29	28	18	18	16	24	21
15-23	21	36	42	41	27	20	18	19	24	20	17
15-24	18	20	17	15	14	14	12	12	14	13	13
15-25	39	76	105	111	62	48	55	65	45	45	35
15-26	24	46	55	67	40	34	24	31	34	38	30
15-27	25	60	60	63	37	31	23	18	22	26	23
15-28	31	37	41	45	28	26	18	19	26	28	25
15-29	76	117	91	72	43	39	20	22	26	36	33
15-30	53	95	110	110	58	38	39	52	62	57	40
15-31	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	51
15-32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	60
15-33	24	48	48	51	23	18	13	9	10	10	21
15-34	37	30	29	ND	ND	ND	ND	ND	ND	ND	ND
Annual Rainfall (inches)	**48.56**	**46.62**	**51.37**	**51.15**	**48.14**	**44.35**	**37.56**	**30.02**	**28.22**	**35.96**	**41.85**

ND = No Data Red = Impaired Water Quality

TABLE #4

WATER QUALITY SAMPLING STATION DATA

Shellfish Management Area 15

Detailed data for each shellfish monitoring station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports can be obtained by writing South Carolina's Department of Health and Environmental Control – Freedom of Information Office at the address below.

Freedom of Information
SC Dept. of Health & Environmental Control
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

TABLE #5

RAINFALL DATA

Shellfish Management Area 15

Source:

2017 – 2019 Data
National Weather Service, Southeastern River Forecast Center
Location: Beaufort, South Carolina

2017 Annual Rainfall Summary
Source: National Weather Service, Southeastern River Forecast Center
Location: Beaufort, South Carolina

2017	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1	0.07					0.08	1.69		0.41			
2			0.08		1.61	0.13	0.01		0.81			
3	0.35		0.03			0.11	0.24	1.41	0.04			
4	0.04	0.07		0.77			1.01	0.19		0.02		
5					0.31	0.01		1.21	0.01			
6				2.14		0.68		0.04				
7	0.92					0.29	0.02	0.01	0.13	0.06		0.28
8	0.01	0.21				0.70	0.01	0.25				0.72
9		0.12					0.34	0.21		0.36	0.09	0.97
10							0.04	1.14	0.03	0.63	0.32	
11							0.14	0.09	1.22	0.01		
12		ND						ND	*6.06			
13					0.11			0.97				
14			0.37		0.64							
15								0.03				
16		0.14						ND				
17							0.61	ND		0.31		
18						0.03	1.39	ND				
19								ND				
20				0.17		0.01	0.19	ND				
21	0.01					0.50	0.04	0.05	0.03			0.10
22	1.62	0.01	0.11		0.11	0.23		ND			0.42	
23	1.70	0.01			2.42	0.07		0.05		0.34		
24	0.06	0.01		0.03	1.87			0.01		0.42	0.67	
25					0.78	0.13	0.75	0.57				0.06
26						0.94	0.11	0.16				
27						0.01	0.98	0.16				
28		0.44				0.02	0.01	0.27				0.03
29			0.06				0.22	0.05				0.13
30						0.03	0.57		0.06			
31			0.01					0.01				
Total	**4.78**	**1.01**	**0.66**	**3.11**	**7.85**	**3.97**	**8.37**	**6.88**	**8.80**	**2.15**	**1.50**	**2.29**

***Days highlighted indicate 4 or more inches of rain in a 24 hour period. Blank fields indicate no rainfall.**

*** Sample dates are indicated in blue.** **ND = No Data** **ANNUAL RAINFALL** **51.37**

2018 Annual Rainfall Summary
Source: National Weather Service, Southeastern River Forecast Center
Location: Beaufort, South Carolina

2018	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1			0.04			0.08	0.19	0.15				
2			0.07					0.03			0.01	1.03
3						0.89	0.02	0.71	0.09		0.01	2.66
4	0.70	0.01					0.12	0.62	0.02			
5		0.39					0.08	0.22			0.80	
6							0.01		0.06		0.32	
7			0.03				0.17	0.07	0.06			
8		0.31		0.35			0.59		0.09	0.55	0.47	
9				0.07		0.57		0.02	0.10	0.24		0.62
10		0.58		0.02		0.37			0.01	2.36	0.50	0.57
11	0.02			0.04					0.01	0.41		
12	0.07	0.07	0.22						0.21			
13	0.53	0.01	0.15			0.47	0.05		0.01		0.83	
14						0.27	1.59	0.01			0.85	1.07
15					0.01	0.03					0.35	1.19
16				0.94	0.13			0.05	0.13			0.01
17					0.23	0.01	1.05					
18			0.04		0.14	0.03	0.92					
19			0.18		0.22		0.77	0.06	0.01		0.07	
20			0.30		0.04		1.61	0.61				0.01
21			0.29		0.02		0.72			0.21		0.10
22								0.02	0.02			0.01
23	0.09			0.34	0.16		0.01					
24				1.69	0.01	0.07	0.13		0.04		0.26	
25			0.04		0.42	0.22	0.53	0.01				
26		0.07	0.05		0.02	0.06	0.03	0.22		0.07	0.02	
27							0.32	0.14		0.09	0.07	
28					1.42	0.08	0.08	0.01	0.07			0.57
29	0.50				0.09		0.07	0.11	0.03			0.46
30							0.77		0.69			0.02
31			0.20		0.33		0.41					0.06
Total	**1.91**	**1.44**	**1.61**	**3.45**	**3.24**	**3.15**	**10.24**	**3.06**	**1.65**	**3.93**	**4.56**	**8.38**

***Days highlighted indicate 4 or more inches of rain in a 24 hour period. Blank fields indicate no rainfall.**

*** Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **46.62**

2019 Annual Rainfall Summary
Source: NOAA Southeast River Forecasting Center
Location: Beaufort, South Carolina

2019	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1			0.01	0.01		0.13			0.18		0.08	
2			0.06	0.65					0.02			0.23
3			0.02	0.03	0.36		0.07	0.26	0.64			
4	0.01	0.13	1.03		0.07			0.04				
5	0.37		0.24	0.07	0.25	1.81	0.20	0.66	2.22	0.01	0.02	
6			0.03	0.05	0.02	0.47	2.19	0.18	0.94	0.21	0.03	
7				0.10		0.85						
8				0.49	0.04	1.66		0.07		0.03	0.32	
9				0.08		0.73						
10				1.11	0.06	0.54	0.03		0.01			
11				0.10		0.02	0.08		0.06			
12		0.01	0.01	0.06		2.53		0.10				
13		0.02		0.04	1.02	1.39		0.01			0.17	0.02
14	0.06				0.05		0.08	0.11		0.08		1.30
15								0.59	0.06		0.55	
16		0.03					0.01	0.27	0.01	1.94	0.56	
17		0.02					0.10	0.53		0.01	0.93	
18	0.02				0.01	0.02		1.71	0.73			0.47
19	0.01	0.02				0.08			0.01	0.01		
20	0.70	0.03		0.32		0.01				1.95		
21		0.17				0.05						
22						0.09						0.01
23						0.75		0.06				2.60
24	0.93						1.29				0.06	1.74
25	0.04	0.03						0.01				0.04
26			0.06									
27										0.09		
28		0.03						0.01		0.08		
29						0.08		0.02				
30	0.03					0.26				0.14		0.20
31								0.52		0.01		0.01
Total	**2.17**	**0.49**	**1.46**	**3.11**	**1.88**	**11.47**	**4.05**	**5.15**	**4.88**	**4.56**	**2.72**	**6.62**

***Days highlighted indicate 4 or more inches of rain in a 24 hour period. Blank fields indicate no rainfall.**

*** Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **48.56**

TABLE #6

Shellfish Management Area 15
Pollution Event Closures
2017 – 2019

Event	Date(s)	Sample Date(s)	Opening Date	Comments
6.06” of Rainfall	9/12/2017	N/A	N/A	Open Shellfish Harvesting Season was closed. No summer harvest in Area 15 during this time.
SSO Incident	9/19/2017	N/A	10/10/17	5,000 Gallon SSO with some sewage entering Ballast Creek, due to tree roots damaging a force main.

TABLE #7
Shellfish Management Area 15
MARINA INVENTORY

Marina	Total Slips	Pump-out Facility	Fuel Dock
Beaufort Yacht and Sailing Club	15/14 Moorings	No	No
Downtown Beaufort	100	Yes	Yes
Lady's Island	70	Yes	No
Marsh Harbor	20	No	No
Port Royal Landing	150	Yes	Yes
Port Royal Seafood	24	No	No
USMCAS Fueling Dock	1	No	Yes
Village at Battery Creek	26	No	No